PROJECT SUMMARY SHEET

PROJECT TITLE NAME: Upper Rapid Creek Watershed Assessment
NAME AND ADDRESS OF LEAD PROJECT SPONSOR:

South Dakota School of Mines & Technology
501 E. St. Joseph St.
Rapid City, S.D. 57701-3995

STATE CONTACT PERSON: Gene Stueven TITLE: Environmental Senior Scientist

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STATE: South Dakota WATERSHED: Rapid Creek Watershed
HUC # 10120110

PROJECT TYPES: [] BASE [x] WATERSHED [] GROUNDWATER [] I&E

WATERBODY TYPES	NPS CATEGORY
[ ] Groundwater	[x] Agriculture
[ ] Lakes/Reservoirs	[ ] Urban Runoff
[ ] Rivers	[x] Silviculture
[x] Streams	[ ] Construction
[ ] Wetlands	[x] Resource Extraction
[ ] Other	[ ] Stowage and Land Disposal
	[ ] Hydrologic Modification
	[ ] Other

PROJECT LATITUDE LONGITUDE

SUMMARIZATION OF MAJOR GOALS:

The long-term goal of the Upper Rapid Creek Watershed Assessment Project is to locate and document sources of nonpoint source pollution in the watershed and produce feasible restoration recommendations. The project will provide the adequate background information needed to develop workplans for a feasible watershed implementation project to improve temperature, physical habitat and other potential water quality concerns associated with past mining activities within portions of the Upper Rapid Creek Watershed. This project will result in a TMDL report for the North Fork of Rapid Creek.

PROJECT DESCRIPTION:

The Upper Rapid Creek Watershed consists of four primary streams, North Fork and South Fork of Rapid Creek, Castle Creek, and Slate Creek. These streams flow into Rapid Creek above Silver City. From Silver City, Rapid Creek flows easterly to Pactola Reservoir. Three of the streams, North Fork and South Fork of Rapid Creek and Castle Creek, have been identified as impaired from acid drainage associated with bog iron deposits. Water quality data collected by the US National Forest Service indicates that temperature is of concern in the North Fork of Rapid Creek. The Upper Rapid Creek Watershed encompasses an area of approximately 292 square miles and is made up mostly of forest service land with some private land located along many of the drainages. Two small communities exist within the watershed, Mystic and Rochford. The population of these communities is mainly seasonal (summer). The watershed has an extensive road network. The watershed assessment will focus on two tributaries of the Upper Rapid Creek Watershed, North Fork of Rapid Creek and North Fork of Castle Creek. This project is intended to be the initial phase of a watershed wide restoration project. Through water quality monitoring, stream gauging, stream physical habitat assessment, and land use analysis on the North Fork of Rapid Creek and the North Fork of Castle Creek, the sources of impairments to the stream and the watershed will be documented and potential feasible alternatives for restoration will be presented in the final project report.

SD DENR 106 - $50,000 SDGFP - $43,243 BHNF - $4,500 Local - $6,606 Total project cost $104,349

2.0 STATEMENT OF NEED

2.1 Rapid Creek is a tributary to the Cheyenne River. This assessment will address water quality and physical habitat issues in the upper reaches of the Rapid Creek Watershed (Upper Rapid Creek) which drains the central Black Hills to Pactola Reservoir. Upper Rapid Creek contains one stream segment, North Fork of Rapid Creek, on the State 303(d) list as an impairment-related TMDL water with temperature identified as the area of concern. The North Fork of Rapid Creek has beneficial use classifications of coldwater marginal fish life propagation waters and limited contact recreation.

2.2 The purpose of this assessment is to determine and quantify impairments to water quality on the North Fork of Rapid Creek and North Fork of Castle Creek and identify sources of water quality impacts to these two tributaries of Rapid Creek (Figure 1). The North Fork of Castle Creek is located in Pennington County and the North Fork of Rapid Creek is located in both Pennington and Lawrence County, South Dakota, with drainage areas of approximately 14 and 36 mi^2, respectively. The Upper Rapid Creek Watershed receives approximately 20 inches of precipitation annually, of which 75% occurs as rainfall between April and September.

2.3 In addition to temperature impairment, a number of agencies and groups (Black Hills Fly Fishermen, South Dakota Game Fish and Parks Department, Black Hills National Forest) have expressed concern with physical habitat and elevated acid content in the North Fork of Rapid Creek and the North Fork of Castle Creek. Additionally, the impact of these tributaries on the receiving water is a concern. The North Fork of Castle Creek flows into Castle Creek and the North Fork of Rapid Creek joins the South Fork of Rapid Creek to form Rapid Creek. There are two main issues associated with these concerns, 1) what is the limiting factor on the health of the fishery, physical habitat and/or water quality, and 2) are there BMP's that can mediate the impacts. Geology of the study area is a controlling factor. These reaches are associated with shale and bog iron deposits located in and adjacent to Upper Rapid Creek and its tributaries. Some of the deposits are undisturbed however, many have been disturbed by past mining activities.

2.4 Land use in the watershed is primarily recreation with agricultural grazing occurring on Black Hills National Forest grazing leases and private ranches located within the watersheds. Logging activities occasionally occur within the watershed as the Forest Service makes logging leases available. Historically, the primary use of the watershed has been mining and logging. In addition to the bog iron deposits, placer and lode gold deposits have been mined and milled extensively throughout the watershed. A few small mines still exist within the watershed and are mined seasonally. The towns of Mystic and Rochford are located within the watershed. In addition, summer cabins as well as ranch houses are found within the watershed.

2.5 The purpose of this assessment is to develop TMDLs with appropriate restoration recommendations for the North Fork Rapid Creek and, if needed, the North Fork Castle Creek to serve as the foundation of a Section 319-implementation project.

3.0 PROJECT DESCRIPTION

3.1 GOALS

The goal of this assessment project is to determine and document sources of impairments on Upper Rapid Creek, focusing on the North Fork of Rapid Creek and North Fork of Castle Creek; and to develop feasible recommendations for restoration. Critical areas of the watershed will be identified for implementation activities. TMDLs will be developed for the impaired waters of the watershed as listed in the 1998 South Dakota 303(d) list.

3.2 OBJECTIVES AND TASKS

OBJECTIVE 1: Conduct a physical assessment of the Upper Rapid Creek Watershed.

TASK 1 A geological survey of the North Fork of Rapid Creek and the North Fork of Castle Creek and their tributaries will be undertaken for the purposes of identifying bog iron deposits, which may be impacting these portions of Upper Rapid Creek. Bog Iron Deposits will be classified as to extent of disturbance. Other potential sources of water quality degradation will be identified during this survey. Geological features associated with the physical habitat of the streams will also be identified. This survey will be conducted using available geological mapping and GIS coverages on the geology of the study area combined with field work to gather supplemental information and verify available mapping.

TASK 2 Physical stream habitat assessments will be conducted at five locations within the watershed. The physical assessments will integrate selected parameters from the T-Walk assessment methodology (Ohlander, 1998), Stream Physical Habitat Assessment (Kaufmann et al, 1999), R1/R4 (Northern/Intermountain Regions) Fish and Fish Habitat Standard Inventory Procedures Handbook (Overton et al., 1997), and Methods For Evaluating Stream, Riparian, and Biotic Conditions (Platts et at., 1983). Prior to conducting the stream assessments the selected parameters will be reviewed with the cooperating agencies. The physical habitat assessment will include estimates of canopy cover using densiometer measurements. Measurements of the physical characteristics of the stream will be used to assess general stream/watershed health at the following locations: headwaters of the North Fork, Rapid Creek, North Fork of Rapid Creek above its confluence with the South Fork of Rapid Creek, Castle Creek above the confluence with the North Fork of Castle Creek, and Castle Creek above and below the confluence with the North Fork of Castle Creek.

TASK 3 Available landuse and land cover GIS coverages from the US Geological Survey and U.S. Forest Service will be obtained and evaluated to identify general land use practices within the study area. Available digital ortho-photo quads will also be used to identify landuse practices. This information will support evaluation of potential sources for pollutant loads.

OBJ-1 Budget Items	DENR	GFP	SDSMT	BHNF	BHFF	Total
Personnel (salary, benefits, admin)	10780	10060	1613	1400	700	24553
Travel	137	117	0	0	0	254
Sample Analysis	0	0	0	0	0	0
Supplies & Materials	6103	4615	0	175	0	10893
TOTALS	17020	14792	1613	1575	700	35700

PRODUCTS:

A GIS coverage showing potential sources of both disturbed and undisturbed bog-iron deposits within the contributing watersheds of the North Fork of Rapid Creek and North Fork of Castle Creek. Description and GIS coverages of prominent geological features affecting stream physical habitat and land cover associated with canopy cover and its potential relationship to stream temperature. A report presenting the stream survey data with interpretation of the current stream physical conditions with emphasis on fish habitat and temperature impairments.

RESPONSIBLE AGENCIES:

Task Responsibilities:

South Dakota School of Mines and Technology

Design and Technical Assistance:

South Dakota Department of Environment and Natural Resources
South Dakota Game Fish and Parks
Black Hills National Forest

WORK ACTIVITIES:

Compile and review available geological mapping and conduct field surveys to enhance and verify locations of bog-iron deposits, physical geology characteristics and conduct stream surveys at five locations in the study area.

OBJECTIVE 2: Collect discharge measurements and water quality measurements on the Upper Rapid Creek Watershed necessary to estimate water quality parameter loadings.

TASK 4 Two continuous water-level recorders and five staff gauges will be installed at the monitoring sites listed below. Maintenance of continuous stage recorders will continue for a full year with exception of winter months after freeze up (approximately 9 months) (Figure 1). Depending

on accessibility, instantaneous stream flow measurements will be made during winter months when water quality samples are collected.

North Fork Rapid Creek

NFRC - 1 will be located near the headwaters of the North Fork of Rapid Creek in the Dumont Area (staff gauge, latitude 44-12-59, longitude –103-46-39).

NFRC - 2 will be located on the North Fork of Rapid Creek between the confluence of Buskala Creek and Tillson Creek (staff gauge, latitude 44-11-51, longitude –103-45-36).

NFRC - 3 will be located on the North Fork of Rapid Creek below the confluence of Tillson Creek (staff gauge, latitude 44-10-38, longitude –103-45-15).

NFRC - 4 will be located on the North Fork of Rapid Creek above its confluence with the South Fork of Rapid Creek (continuous recording, latitude 44-07-55, longitude –103-44-09).

North Fork Castle Creek

NFCC - 1 will be located on Castle Creek above the confluence with the North Fork of Castle Creek (staff gauge, latitude 44-04-25, longitude –103-44-54).

NFCC - 2 will be located on North Fork of Castle Creek above its confluence with Castle Creek (continuous recording, latitude 44-04-30, longitude –103-44-54).

NFCC - 3 will be located on Castle Creek below the confluence of the North Fork of Castle Creek (staff gauge, latitude 44-04-35, longitude –103-44-41).

TASK 5 Discrete discharge measurements will be taken on a regular schedule (at a minimum monthly). Discharge measurements will be taken with a hand-held current velocity meter under wadeable conditions. Discharge measurements and stage records will be used to generate stage-discharge relations. Water discharge will be measured through a combination of two continuous recording and five staff gauging stations. Continuous flows at the staff gauging stations will be developed using regressional relationships with the two continuous stations. Continuous flows on Castle Creek will also use the existing continuous gauging stations on Castle Creek below Deerfield Dam.

TASK 6 Water-quality samples will be collected from the seven monitoring sites. Samples will be collected at two-week intervals during a two-month period of spring runoff (March 15 - May 15). Two to four selected storm events will be sampled, and base flows will be sampled on a monthly basis at each site. Storm event samples will be considered the monthly sample. Additionally, up to five samples will be collected at tributaries and /or springs identified during the study that represent significant contributions from bog-iron areas. The parameters to be collected and analyzed for all samples collected are presented in Table 1. Trace elements will be analyzed for on a quarterly basis and for rain event samples. The trace elements to be analyzed for are listed in Table 2. Hardness is included with the trace element analysis because the toxicity is typically a function of hardness. Total organic carbon has also been included on a quarterly basis to enhance evaluation of productivity. Table 3 shows the number and cost of regular, event, and trace element samples to be collected from each site. In addition, Table 3 also shows the standard laboratory method to be used for each parameter.

TASK 7 Place continuous temperatures recorders at each water quality monitoring station from May through October. Provide maintenance and download data on a monthly basis.

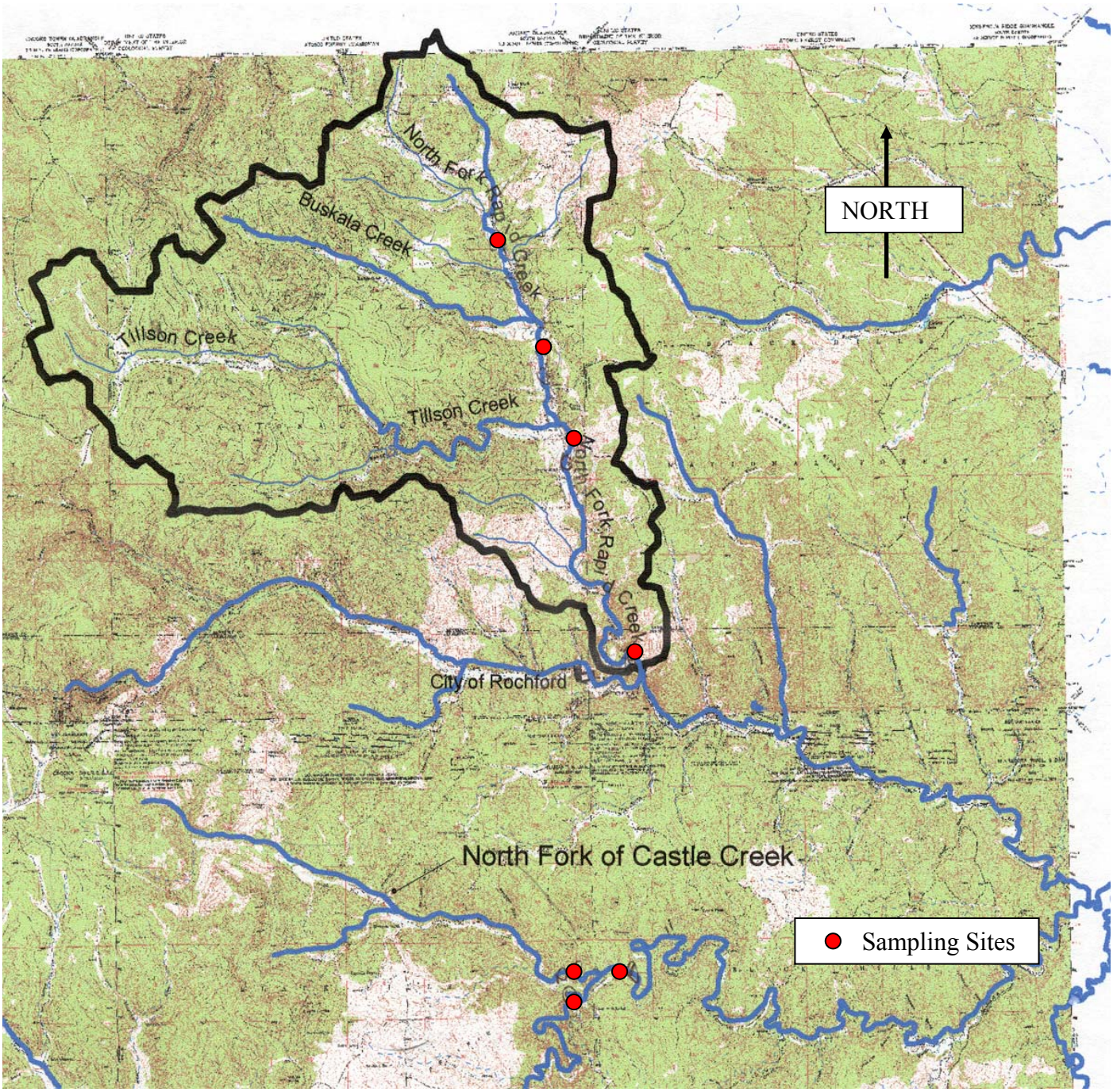

Figure 1. Study area and sampling locations

Table 1. Parameters to be measured for all samples

PHYSICAL/FIELD PARAMETERS	CHEMICAL
Air temperature	Alkalinity
Discharge	Ammonia as N
Dissolved oxygen	Nitrate + Nitrite as N
Field pH	Total Phosphate
Specific Conductance	Ortho Phosphate
Stage	Total Fecal Coliform
Visual observations	Total Dissolved Solids
Water temperature	Total Suspended Solids
Turbidity	Chlorophyll *a* (to be analyzed by State Lab)

Table 2. Trace element analysis parameters for selected sites

Parameter	
Mercury	Lead
Aluminum	Silver
Arsenic	Cadmium
Copper	Selenium
Hardness	Zinc
Total Organic Carbon	

OBJ-2 Budget Items	DENR	GFP	SDSMT	BHNF	BHFF	Total
Personnel (salary, benefits, admin)	9240	8623	1382	1200	600	21045
Travel	116	99	0	0	0	215
Sample Analysis	9155	6867	0	0	0	16022
Supplies & Materials	345	270	0	150	0	765
TOTALS	18856	15859	1382	1350	600	38047

PRODUCTS:

A tributary water-quality report, which will include a description of the relationship between and influence of chemical and physical data, will be produced. Eighty-five water quality samples will be collected.

RESPONSIBLE AGENCIES:

Task Responsibilities:

South Dakota School of Mines and Technology and US Geological Survey

Design and Technical Assistance:

South Dakota Department of Environment and Natural Resources
South Dakota Game Fish and Parks
Black Hills National Forest

WORK ACTIVITIES:

Water samples will be collected with an isokinetic sampler to ensure a depth-integrated sample along the stream cross-section for grab samples. For suspended-sediment samples, the appropriate suspended-sediment sampler will be used. Samples will be composited then processed into the appropriate bottles for delivery to the laboratory. All samples will be collected, iced and delivered to the lab using the approved methods described in the Standard Operating Procedures for Field

Table 3.

Standard Analysis					**Trace Element Analysis**				
	Unit Cost	Reporting Limit	Unit	EPA Method		Unit Cost	Reporting Limit	Unit	EPA Method
Alkalinity	$6.00	1	mg/l	EPA 310.1	Aluminum	$10.00	0.1	mg/l	EPA 200.7
Ammonia - N	$7.50	0.1	mg/l	EPA 350.1	Arsenic	$10.00	0.005	mg/l	EPA 200.7
Nitrate + Nitrite as N	$7.50	0.05	mg/l	EPA 353.2	Copper	$10.00	0.01	mg/l	EPA 200.7
Total Phosphate	$15.00	0.01	mg/l	EPA 365.1	Lead	$10.00	0.01	mg/l	EPA 200.7
Ortho - P	$10.00	0.01	mg/l	EPA 365.1	Silver	$10.00	0.005	mg/l	EPA 200.7
Total Fecal Coliform	$15.00	1	col/100ml	SM 9222 D	Cadmium	$10.00	0.001	mg/l	EPA 200.7
Total Dissolved Solids	$6.00	10	mg/l	EPA 160.1	Selenium	$10.00	0.005	mg/l	EPA 200.7
Total Suspended Solids	$6.00	10	mg/l	EPA 160.2	Mercury	$15.00	0.0002	mg/l	EPA 245.1
Chlorophyll *a*	State Lab				Zinc	$10.00	0.01	mg/l	EPA 200.7
					TOC	$25.00	2	mg/l	EPA 415.2
					Hardness	$15.00	1	mg/l	SM 2340 B

Cost per Sample	$73.00		$125.00	
Regular Monthly & Event Samples			Trace Element Analysis	
Monthly samples	12		quarterly plus events	
Storms	2		2	
Snow melt (extra)	2			
total per site	16			
total for 7 sites	112		28	
Tributary Samples	5		5	
QA/QC	22		7	
total samples	139		42	
Cost analysis	**$10,147.00**		**$5,875.00**	
Estimated Total Analysis Cost		**$16,022.00**		

Samplers by the State of South Dakota South Dakota Watershed Protection Program. Energy Laboratories Inc. in Rapid City, SD City will analyze all samples using state and EPA approved methods. The watershed water quality data will be integrated together with the hydrologic loading to provide a complete analysis of the hydrologic systems.

OBJECTIVE 3: **Characterize the benthic macroinvertebrate communities within the Upper Rapid Creek watershed. This information will be used to develop biological indices to supplement assessment of water quality characteristics of the North Fork of Rapid Creek and North Fork of Castle Creek and their tributaries.**

TASK 8 A total of five sites are proposed for biological sampling. These sites will be within the reaches where the stream physical habitat assessments are conducted. The specific location of biological sampling sites will take into consideration potential reference sites and impacted sites within the watershed. Additionally, sample sites will be coordinated with water quality sampling sites. The sampling technique will be consistent with methods identified in the Standard Operating Procedures for Field Samplers, South Dakota Watershed Protection.

TASK 9 Biological samples will be sent to an independent laboratory for taxonomic identification to the lowest practical level (generally genus/species).

TASK 10 The taxonomic data will be used to calculate a simple metric of biological indices to include, abundance, taxonomic diversity, family biotic index, and EPT/C ratio.

OBJ-3 Budget Items	DENR	GFP	SDSMT	BHNF	BHFF	Total
Personnel (salary, benefits, admin)	1848	1725	276	240	120	4209
Travel	32	27	0	0	0	59
Sample Analysis	2125	1593	0	0	0	3718
Supplies & Materials	69	54	0	30	0	153
TOTALS	4047	3399	276	270	120	8139

PRODUCTS:

The final report will include a presentation of the biological data and a characterization of the biological indices as they relate to water quality and land use within the watershed. Three benthic macroinvertebrate samples will be collected at five sites.

RESPONSIBLE AGENCIES:

Task Responsibilities:

South Dakota School of Mines and Technology

Design and Technical Assistance:

South Dakota Department of Environment and Natural Resources
South Dakota Game Fish and Parks

WORK ACTIVITIES:

Biological samples will be collected once at five sites. Biological samples will be sent to an independent laboratory for taxonomic identification to the genus level. The taxonomic data will be used to calculate a simple metric of biological indices to include, abundance, taxonomic diversity, family biotic index, and EPT/C ratio.

OBJECTIVE 4: **Approved Quality Assurance/Quality Control procedures will be used to ensure that all samples are accurate and defendable.**

TASK 11 The collection of all field data will be accomplished in accordance with the Standard Operating Procedures for Field Samplers, South Dakota Watershed Protection.

TASK 12 A minimum of 10 percent of all the water quality and biological samples collected will be QA/QC samples. QA/QC samples will consist of field blanks and field duplicates or field replicate samples. An estimated eight water-quality and one biological quality assurance sample will be collected during the project.

TASK 13 All QA/QC activities will be conducted in accordance with the Nonpoint Source Program Quality Assurance Project Plan.

TASK 14 The activities involved with QA/QC procedures and the results of QA/QC monitoring will be compiled and reported on in a section of the final project report and in all project quarterly progress reports.

OBJ-4 Budget Items	DENR	GFP	SDSMT	BHNF	BHFF	Total
Personnel (salary, benefits, admin)	1232	1150	184	160	80	2806
Travel	14	12	0	0	0	26
Sample Analysis	720	540	0	0	0	1260
Supplies & Materials	46	36	0	20	0	102
TOTALS	2012	1738	184	180	80	4194

PRODUCTS:

A Quality Assurance/Quality Control monitoring report.
Estimated nine samples collected.

RESPONSIBLE AGENCIES:

Task Responsibilities:

South Dakota School of Mines and Technology

Design and Technical Assistance:

South Dakota Department of Environment and Natural Resources
South Dakota Game Fish and Parks
Black Hills National Forest

WORK ACTIVITIES:

Approved QA/QC will be utilized on all sampling and field data collected during the Upper Rapid Creek Assessment project. Please refer to the South Dakota Nonpoint Source Program Quality Assurance Plan and the South Dakota Watershed Protection Program Standard Operating Procedures for Field Samplers for details of the procedures to be followed.

OBJECTIVE 5: Public participation and involvement.

TASK 15 A minimum of two public meetings will be held to the public and interested parties of progress on the study. Public participation and involvement will be encouraged. These meetings will provide an avenue for input from residents in the area and interested groups. Notification of meeting will be made to local agencies and newspapers

TASK 16 Biannual progress reports will be completed and presented at the appropriate general public meeting to keep the involved parties up-to-date with work activities and time-line completion.

OBJ-5 Budget Items	DENR	GFP	SDSMT	BHNF	BHFF	Total
Personnel (salary, benefits, admin)	1540	1437	230	200	100	3507
Travel	18	15	0	0	0	33
Sample Analysis	0	0	0	0	0	0
Supplies & Materials	58	45	0	25	0	128
TOTALS	1616	1497	230	225	100	3668

PRODUCTS:

Public input to the project. Three public meetings providing information and education about the project. A brochure on the bog iron issues will be developed for the Black Hills National Forest for education purposes.

RESPONSIBLE AGENCIES:

Task Responsibilities:

South Dakota School of Mines and Technology

Design and Technical Assistance:

South Dakota Department of Environment and Natural Resources
South Dakota Game Fish and Parks
Black Hills National Forest

WORK ACTIVITIES:

Three informational meetings will be held for the public to inform the involved parties of progress on the study and provide a means of public input.

OBJECTIVE 6: **Development of watershed management recommendations.**

TASK 17 Concurrently with collection of field data, a review of the historical and project data will be conducted.

TASK 18 A hydrologic analysis will be conducted to assess temperature impacts. There are several temperature models that can be applied including QUAL2E.

TASK 19 A hydrologic budget analysis and modeling (as necessary) will be conducted on other water quality parameters.

TASK 20 The feasible management practices will be compiled into a list of recommendations for the development of an implementation project and TMDL for the North Fork of Rapid Creek.

TASK 21 The results of the geological survey and the stream physical habit assessments will be evaluated to identify relationships between geology and physical habitat. This evaluation will be conducted to identify limitations the geology has on physical habitat and potential for physical habitat improvements. The potential benefit of physical habitat improvements must consider economics, improvement in the fishery and durability of the habitat features.

OBJ-6 Budget Items	DENR	GFP	SDSMT	BHNF	BHFF	Total
Personnel (salary, benefits, admin)	3080	2874	461	400	200	7015
Travel	35	30	0	0	0	65
Sample Analysis	0	0	0	0	0	0
Supplies & Materials	115	90	0	50	0	255
TOTALS	3230	2994	461	450	200	7335

PRODUCTS:

A list of viable watershed restoration recommendations for the North Fork of Rapid Creek and North Fork of Castle Creek.

RESPONSIBLE AGENCIES:

Task Responsibilities:

South Dakota School of Mines and Technology

Design and Technical Assistance:

South Dakota Department of Environment and Natural Resources
South Dakota Game Fish and Parks
Black Hills National Forest

WORK ACTIVITIES:

A hydrologic budget and pollutant loadings will be calculated for the two study reaches, North Fork of Rapid Creek and North Fork of Castle Creek. An extensive review and study of the historical and current data will be done to determine the best management practices and hydrologic restoration techniques needed to improve water quality. Relationships between geology and stream physical habitat, and potential habitat improvements will be evaluated.

OBJECTIVE 7: **Produce and publish a final project report containing a temperature TMDL for the North Fork of Rapid Creek, identification of other potential water quality impairments and BMP recommendations.**

TASK 22 Document discharge measurements, water quality data, and methods used to calculate hydrologic budgets and pollutant loadings.

TASK 23 Write a summary of historical water quality and land use information and compare with project data to determine any possible trends.

TASK 24 Write a summary of the relationships between geology and stream physical habitat features and the potential for stream habitat improvements.

TASK 25 Based on the data and information compiled for the project prepare a description of the physical, chemical, and biological condition of the river and its tributaries.

TASK 26 Write a summary report of all QA/QC activities conducted during the project and include in the final project report.

TASK 27 Write a description of feasible restoration recommendations for use in planning watershed nonpoint source implementation and develop a temperature TMDL for the North Fork of Rapid Creek. The North Fork of Castle Creek is not a listed waterbody, although the evaluation of the North Fork of Castle Creek will be completed so that a TMDL could be written and/or a 319 implementation project could be developed.

TASK 28 Compile field data and information analysis, TMDL development, and restoration recommendations into a final report by November 30, 2002.

OBJ-7 Budget Items	DENR	GFP	SDSMT	BHNF	BHFF	Total
Personnel (salary, benefits, admin)	3080	2874	461	400	200	7015
Travel	0	0	0	0	0	0
Sample Analysis	0	0	0	0	0	0
Supplies & Materials	115	90	0	50	0	255
TOTALS	3195	2964	461	450	200	7270

PRODUCTS:

A final project report incorporating all previously described objectives

RESPONSIBLE AGENCIES:

South Dakota School of Mines & Technology
(Report published by South Dakota Department of Environment and Natural Resources)

WORK ACTIVITIES:

Statistical evaluation of all water quality and field data produced during the course of the study. Review and compilation of historical data will be completed. Restoration alternatives will be developed. Graphic presentations of the information will be produced.

3.3 MILESTONE TABLE – The proposed project schedule is given in the Table below.

OBJECTIVE	2001										2002					
	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1- Physical Assessment																
2- Discharge Measurements and Water Quality																
3 - Benthic Analysis																
4 - QA/QC																
5 - Public Participation																
6 - Watershed Management Alternatives																
7 - Final Report and North Fork Rapid Creek TMDL																

3.4 No special permits are required to do this assessment project.

3.5 The South Dakota School of Mines and Technology will serve as the project sponsor. The main concern currently identified in the study is temperature.

4.0 COORDINATION PLAN

4.1 The following groups/agencies have agreed through an informal agreement to cooperate in the Upper Rapid Creek watershed assessment project.

US Environmental Protection Agency –Financial support and technical assistance

SD Department of Environment and Natural Resources – Financial support and technical assistance

South Dakota Game Fish and Parks – Financial support and technical assistance

US Forest Service, Black Hills National Forest – Financial support and technical assistance

Black Hills Fly Fishers – local financial support

South Dakota School of Mines and Technology – Local financial support and project sponsor

4.3 The project has been presented to SD DENR, SDGFP, BHNF and BHFF. All agencies have expressed support for the project. The BHNF through the Black Hills Parks and Forest Association have given approval for funding support and the BHFF voted to approve funding support upon approval of the project work plan. The SDGFP has budgeted funding for the project and is in the process of reviewing the proposal.

4.4 This project will coordinate activities with state, federal, and local government agencies through frequent personal communication and public meetings. SD Game, Fish, and Parks, BHNF, local organizations, and local government agencies will provide input and involvement in this assessment.

4.5 There currently are no other agencies conducting watershed assessments project activities on the in the Upper Rapid Creek Watershed. A study sponsored by the US Bureau of Reclamation through South Dakota State University is being conducted to assess the effects of water quality on available nutrients in Rapid Creek above Pactola reservoir. This project will focus on the upper Rapid Creek Watershed and will coordinate with the BOR project to obtain information that can potentially enhance this assessment.

5.0 EVALUATION AND MONITORING PLAN

5.1 The monitoring strategy is explained in section 3. The project will produce bi-annual progress reports. The sampling and analysis procedures required to complete the tasks within section 3 can be located in the Standard Operating Procedures for Field Samplers for the South Dakota Watershed Protection Program (SOP). The specific locations of these sampling methods within the SOP as they pertain to each task are documented in Table 4 on the following page.

5.2 This assessment project consists of a combination of chemical, hydrologic, land use and biological analyses. Monitoring sites will be maintained and sampled on the North Fork of Rapid Creek, North Fork of Castle Creek and on the main stem of Castle Creek. Ambient samples will be collected along with spring runoff and storm events. Stream discharge will be routinely measured. The chemical, physical, and biological parameters to be sampled during this project can be located in Table 1 (page 6) and Table 2 (page 6). Loads will be calculated based on the samples and data collected with the approved methods identified in section 5.1. TMDL reports will be produced for the North Fork of Rapid Creek and as necessary on the North Fork of Castle Creek.

5.3 All water quality monitoring will be done in accordance with the approved South Dakota Nonpoint Source Program Quality Assurance/Quality Control Project Plan and the Standard Operating Procedures for Field Samplers for the South Dakota Watershed Protection Program.

5.4 Results from all water-quality monitoring efforts under the Upper Rapid Creek Watershed Assessment Project will be reported in the final project report. Data will provided to the South Dakota Department of Environment and Natural Resources in a format compatible to the State's water quality database management system. This data will be used as the foundation of a Section 319 Watershed Implementation Project proposal.

6.0 BUDGET

UPPER RAPID CREEK WATERSHED ASSESSMENT						
Budget Items	**DENR**	**GFP**	**SDSMT**	**BHNF***	**BHFF**	**Total**
Personnel (salary, benefits, admin)	30800	28743	4606	4000	2000	70149
Travel	350	300				650
Sample Analysis	12000	9000				21000
Supplies & Materials	6850	5200		500		12550
TOTALS	50000	43243	4606	4500	2000	104349

*The Black Hills National Forest has authorized project expenses through the Black Hills Parks & Forests Association

7.0 PUBLIC INVOLVEMENT

See Objective 5.

TABLE 4. Location of Sampling and Analysis Procedures for each applicable task involved with the Upper Rapid Creek Watershed Assessment Project.

TASK NUMBER	TASK DESCRIPTION	ACTIVITY	REFERENCE IN SDWRA-1999 SOP
Objective1 Task 2	Physical stream habitat assessment will be conducted on five reaches in the study area. Additional, parameters will be included to adequately characterize the physical habit.	Physical Habitat Assessment	Section 16.0 pges 1-15
Objective2 Task 5	Discrete discharge measurements will be taken on a regular schedule and during storm surges.	Flow (Marsh-McBirney), Flow (AquaCalc), or Pygmy current meter.	Section 7.1 pges 5-9 and USGS Approved Discharge Measurement Methods
Objective 2 Task 6	Collect water quality samples from 7 monitoring sites. Table 3 shows the parameters to be measured. Sampling twice weekly during snowmelt and once a week thereafter until runoff ceases. Storm events and base flows will be sampled throughout the project period for an estimated total number of 85 samples.	Tributary Sampling Procedures	Section 7.1 pges 1-18
Objective 3 Task 8	Techniques adopted by the US EPA EMAP program will be used for collection of benthic samples.	Benthic Macroinvertebrate Sampling	Section 15.0 pges 6-13 Section 15.1 pges 1-16 Surface Waters: Quantifying Physical Habitat in Wadeable Streams (EMAP)
Objective 4 Task 12	A minimum of 10 percent of all the water quality samples collected will be QA/QC samples. QA/QC samples will consist of field blanks and field duplicate samples. An estimated 8 water quality and 1 biological quality assurance samples will be collected during the project.	Quality Assurance (water quality) Quality Assurance (Macroinvertebrates)	Section 10.0 pges 1-3 Section 15.1 pges 15-16
Objective 4 Task 13	All QA/QC activities will be conducted in accordance with the Non Point Source Program Quality Assurance Project Plan.	Quality Assurance	Section 10.0 pges 1-3
Objective 4 Task 14	The activities involved with QA/QC procedures and the results of QA/QC monitoring will be compiled and reported in a section of the final project report and in all project reports.	Quality Assurance	Section 10.0 pges 1-7

EXHIBIT B